

Applicants: Suemasu et al.  
Serial No.: 10/820,272  
Filing Date: April 8, 2004  
Preliminary Amendment  
Page 2 of 5

**IN THE CLAIMS:**

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A metal filling method comprising: steps of: a first step of forming a fine hole in a work piece: a second step of forming a metal layer on an inner surface of one end of a said fine hole that opens in the outer surface of a work piece; immersing said work piece in a plating solution; and a third step of filling this plating solution a molten metal into said fine hole; and removing said work piece from said plating solution with one of ends along an axial direction of said fine hole is still occluded and then cooling said work piece.
2. (Currently Amended) A metal filling method according to claim 1 Claim 1, wherein[;]: said fine hole is a through hole that passes extends through said work piece[;];  
in said second step, said metal layer is formed on the inner surface of at least one end of both ends in said an axial direction of said through hole[;]:  
in said third step, by immersing and when said work piece, which has been immersed said plating solution to fill said plating solution into said molten metal, said molten metal is filled into said through hole; and  
the metal filling method further comprises a fourth step of closing at least one of two openings of said through hole; and a fifth step of removing said work piece out from said molten metal is removed from said plating solution, an opening in the other end of said axial direction of said through hole is occluded with a sealing material as said one of ends along said axial direction of said fine hole.

Applicants: Suemasu et al.  
Serial No.: 10/820,272  
Filing Date: April 8, 2004  
Preliminary Amendment  
Page 3 of 5

3. (Currently Amended) A metal filling method according to claim 2 Claim 2,  
wherein[;]: in said second step, said metal layer is further formed on the  
surface of said work piece and around the opening in said one end said inner surface of the  
end of said fine hole that opens in the outer surface of said work piece as well as on the outer  
surface of said work piece extending around the end of said fine hole on which said metal  
layer is formed;

in said fifth step, a padding portion which is united with said molten metal and  
after immersing this work piece in said plating solution within a plating solution bath to fill  
said plating solution into said fine hole but prior to cooling of said work piece, said plating  
solution filled into said fine hole is padded at the sites where said metal layer was formed on  
the inner surface of the end of said fine hole that opens on the outer surface of said work  
piece and on the outer surface of said work piece extending around the end of said fine hole  
on said work piece which is removed said outer surface by removing said work piece out  
from said plating solution molten metal; and

the metal filling method further comprises a sixth step of solidifying then, a  
filled metal section formed by solidification of said plating solution said molten metal within  
said fine holes, and an external metal section formed by solidification of said padded sections  
of the said plating solution, are formed unitarily by cooling said work piece hole and said  
molten metal forming said padding portion.

4. (Currently Amended) A metal filling method according to claim 1 Claim 1,  
wherein[;]: said work piece is a substrate[;]; and  
said fine hole is formed as a non-through hole[;] which opens to only one of  
the top and bottom surfaces of said substrate or a through hole, which open to both the top  
and bottom surfaces of said substrate, are formed as said fine hole in said substrate.

5. (Currently Amended) A metal filling method according to claim 3 Claim 3,  
wherein, prior to immersing said work piece in said plating solution, a shape of said metal  
layer formed on around the opening of said fine hole in the outer surface of said work piece is

Applicants: Suemasu et al.  
Serial No.: 10/820,272  
Filing Date: April 8, 2004  
Preliminary Amendment  
Page 4 of 5

patterned corresponding to a shape of said ~~external metal section padding portion~~ to be formed.

6. (Cancelled)
7. (Cancelled)
8. (New) A metal filling method according to Claim 1,  
wherein: said work piece is a substrate; and  
said fine hole is formed as a through hole, which opens to both top and bottom surfaces of said substrate.